1/10/89

[San Francisco (Calif.) Health Dept.]

Report on Cancer Incidence in San Francisco

Executive summary

In response to a request from a citizen's group, the San Francisco Department of Public Health conducted a study of cancer incidence in San Francisco. The primary focus was on the incidence of cancers occurring in San Franciscan children of less than 15 years of age. The initial study period was between 1973 and 1985, with data from 1986 and 1987 reviewed subsequently.

The methodology identified the number of childhood cancers reported throughout San Francisco and in four designated areas, and compared them with the number of cases statistically expected based on cancer incidence rates for the San Francisco-Oakland Metropolitan Statistical Area (SF-O SMSA).

The results indicate that the number of childhood cancers was not greater than expected for San Francisco as a whole. In one of the designated geographical areas, Noe/Eureka Valley, there were more cases than would have been expected during the initial 13 year study period; 21 cases were observed whereas one would have expected 11.8 cases. Of these 21 cases, 14 were in the 0-4 age group (expected number = 5.7). More recent data from 1986 and 1987 (cases reported by October 1988) showed no cases reported from this area.

The same methodology was applied examining cancer rates among white San Francisco residents (male and female; all ages combined) between 1981 and 1985. There were no greater than expected numbers of cancers for whites in San Francisco as a whole or in any of the designated areas after accounting for AIDS related cancers.

The data and interpretations of this study were reviewed by epidemiologists from the California Department of Health Services.

It has been concluded that in the initial study there was a increase of childhood cancers in one of four areas. More recent data show no evidence of a continuing increased incidence of childhood cancers in this area. The San Francisco Department of Public Health in association with concerned citizens will undertake an investigation of environmental exposures of concern and will undertake a follow-up epidemiological study in an attempt to identify geographical sites of possible environmental exposures.

Introduction

The Department of Public Health was approached by a group of San Francisco citizens who wanted to know whether the incidence of cancer was increased in certain areas of San Francisco.

The areas of interest were defined, using street and census tract maps of San Francisco, as follows:

a) Haight area
Census tracts (166.00, 167.00, 168.00, 170.00, 171.00, 301.01, 301.02, 305.00) This is an area approximately bounded by Oak Street, Kezar Drive, 7th Avenue, Laguna Honda Boulevard, Woodside Boulevard, 17th Street, Castro Street, Duboce Street and Market Street.

b) Noe/Eureka Valley
Census tracts (169.00, 202.00, 203.00, 205.00, 206.00, 207.00, 210.00, 211.00, 212.00, 213.00, 214.00, 215.00, 216.00) This is an area approximately bounded by Market Street, Duboce Street, Castro Street, 17th Street, Douglas Street, Grand View Avenue, Portola Drive, Diamond Heights Blvd, 30th Street, San Jose Avenue and Valencia Street.

c) East Sunset
Census tracts (302.00, 303.00, 304.00, 308.00, 326.00, 328.00) This is an area approximately bounded by Lincoln Way, 28th Avenue, Taraval Street, 19th Avenue, St. Francis Boulevard, Casitas Avenue, Dewey Boulevard, Laguna Honda Blvd and 7th Avenue.

d) Rest of San Francisco
All other census tracts

They requested that the following cancers be studied:

1) <15 years: all cancers, leukemia, brain and nervous system
2) all ages: all cancers, leukemia

The Department undertook to calculate expected numbers of cancers for the areas by cancer type and to compare the observed numbers with the expected numbers. However the citizens' group was cautioned about drawing any causative inferences from such analyses.

Analyses for children <15 years are contained in Section 1 and analyses for all age groups combined are contained in Section 2.

Section 1. Child cancer incidence in San Francisco, 1973-1985.

This report concerns childhood cancers only and addresses whether:

i) For the period 1973-1985, the observed number of childhood cancers in San Francisco was higher than expected (based on incidence rates for the San Francisco-Oakland Metropolitan Statistical Area)?

ii) For the period 1973-1985 the observed numbers of childhood cancers in the designated areas were higher than expected (based on incidence rates for the San Francisco-Oakland Metropolitan Statistical Area)?

Methods

1. Cancer Definitions

1.1 All cases: All residents of San Francisco, diagnosed with cancer between 1973-1985, less than 15 years of age, included in the SEER public use tape for the San Francisco-Oakland MSA.

1.1 Leukemia cases:
Cases fulfilling the criteria for 2.1 with ICD-O 1976 morphology codes 980-994.

1.1 Brain and nervous system:
Cases fulfilling the criteria for 2.1 with ICD-O 1976 topology codes 191.0-192.9.

2. Data Sources

2.1 SEER public use tape for the San Francisco-Oakland Metropolitan Statistical Area 1973-1985.
The observed numbers of childhood (<15 years of age) cancer cases for San Francisco (and for each defined area) were obtained by analysing this data set obtained from the Cancer Prevention Section, California Department of Health Services.

2.2 1980 U.S. Census Data
The number of children <15 years of age living in each area in 1980 was obtained by analysing 1980 US Census data provided on a computer tape by the Population Research Unit, California Department of Finance.

2.3 Projected populations for California Counties
The projected number of children <15 years of age living in San Francisco between 1973-1985 was obtained from data provided by the Population Research Unit, California Department of Finance (Population Research Unit, California Department of Finance, Population Projections for California Counties; 1970-2020; age/sex detail to 2020. DOF Baseline 86. Unpublished data.)

2.4 Incidence of childhood cancer in the San Francisco-Oakland Metropolitan Statistical Area.

Incidence rates for childhood cancer for the San Francisco-Oakland Metropolitan Statistical area were obtained from the Cancer Prevention Section, California Department of Health Services (Cancer in California; The Incidence of Childhood Cancer San Francisco-Oakland Metropolitan Statistical Area 1970-84, Technical Report No. 3, California Tumor Registry, Cancer Prevention Section, Department of Health Services, State of California).

Analyses

1) Are there more than expected of childhood cancers in San Francisco?

The expected number of childhood cancer cases in San Francisco 1973-1985 was calculated using San Francisco-Oakland 1970-1984 rates (Table 1) and estimated San Francisco population data obtained by summing the number of children in the 0-4 year, 5-9 and 10-14 year categories for the period 1973-1985 using California Department of Finance projected data for inter-censal years (Table 2). The observed number of cases was obtained from the SEER Registry data. Confidence intervals (99% and 95%) around the observed numbers were computed using CANCER CALC. This is public domain software developed by Michael Layefsky, of the California Department of Health Services.

2) Are there more than expected childhood cancers in the areas of interest?

The expected numbers of cancer cases in each of the San Francisco areas as defined previously were calculated using the San Francisco-Oakland rates and estimated census tract childhood populations for 1973-1985. As there are no population estimates available for individual census tracts for inter-censal years the population at risk in these areas was estimated using 1980 census data and projected population data for the whole of San Francisco. This estimate for the population at risk does not take into account variability in population shifts between census tract areas in inter-censal years.

Results

1. Are there more than expected childhood cancers in San Francisco?

The observed (with 99% and 95% confidence intervals) and the expected number of cancer cases are shown in Table 3.

For none of the analyses are the observed number of cancers statistically significantly different from the expected numbers.

2. Are there more than expected childhood cancers in the designated areas?
The census tracts of residence of cases at the time of diagnosis of cancer are shown in Figure 1.
In the Haight area, there are no statistically significant excesses in observed cases (Table 4).

In the Noe/Eureka Valley area, for all age-groups combined the observed number of all cancers (21 cases) is statistically significantly greater than the expected number (11.8 cases) at the 95% level, but not at the 99% level. The observed numbers of leukemias and brain cancers are not statistically significantly greater than expected. In the 0-4 year age group 14 cancers were found whereas one would have expected 5.7 cases. This is statistically significant at the 99% level. For age-groups 5-9 and 10-14 years the observed numbers of cases are similar to the expected numbers (Table 5).

In the East Sunset area, there are no statistically significant differences of observed cancers (Table 6).

For the remaining areas of San Francisco, there are no statistically significant differences of observed cancers (Table 7).

The increased numbers of cases in the Noe/Eureka Valley area reflects an increased incidence only between 1980 and 1985. Between 1973 and 1979 7 (6.8%) of the 102 childhood cancer cases were diagnosed in Noe/Eureka Valley area residents compared with 14 (15.7%) of 89 cases diagnosed between 1980 and 1985 (Table 8). Between 1980 and 1985 one would have expected 5.3 cases compared with the observed 14. This is significant at the 99% level. More recent data shows, however, no cases in 1986 or 1987 (cases reported by October 1988) from the Noe/Eureka valley area.

Discussion

The number of all childhood cancers observed in the whole of San Francisco for the period 1973-1985 was similar to the number one might expect based on the 1970-1984 SF-O MSA incidence rates. This is also true for leukemia and brain and nervous system cancers.

For the areas analysed separately, a statistically significantly increase in the number of cases was found for all anatomical sites combined for Noe/Eureka Valley area children. This was due to an increase in the 0-4 year age group.

There are a number of possible explanations for the increased number of cancers in Noe/Eureka Valley during the 1980-85 period:

i) The number of children 0-14 years living in the Noe/Eureka Valley area was underestimated, resulting in an underestimate of the expected number of cancer cases (the opposite may also be true). Both the Association of Bay Area Governments (ABAG) and private firms do population projections by census tract. However, the census tract projections are based on projections for the whole city and are unreliable. Short of doing a census of the Noe/Eureka Valley area there is no good way of accurately determining the number of children 0-14 years in this area. In the period 1982-1985, the proportion of San Francisco births with addresses in Noe/Eureka Valley was 6.4%. In 1980, 6.4% of San Francisco children 0-4 years of age lived in Noe/Eureka Valley. These data do not suggest a positive in-migration of families with young children into Noe/Eureka Valley since 1980. It should be borne in mind that children living in Noe/Eureka Valley at the time of diagnosis may have lived in other areas prior to living in Noe/Eureka Valley or may have spent a large part of their time outside of Noe/Eureka Valley. The increase in childhood cancers attributed to the Noe/Eureka Valley area may be due to exposures incurred outside of the area. The converse may also be true.

ii) This may be a chance finding. The excess in cancers is statistically significant at the 95% level (but not at the 99% level). We would have expected to find numbers of childhood cases outside the 95% confidence limits (13.0 through 32.1) in 5 of every 100 samples of this size of San Francisco-Oakland SMA children and outside the 99% confidence limits (11.1-36.0) in 1 of every 100 samples. The finding of 11.8 corresponds to the lower 98% confidence limit, i.e., we would have expected to find a value of 11.9 or less by chance alone in 1 of every 100 samples. The fact that there were no childhood cases from Noe/Eureka in 1986 and 1987 (cases reported by October 1988) strengthens the possibility of a chance finding.

iii) There was a real increase of childhood cancer cases in the Noe/Eureka Valley area. Investigations of cancer clusters rarely identify possible environmental causes of these cancers especially in non-occupational settings (SL Warner, TE Aldrich. The status of cancer cluster investigations undertaken by state health departments. AJPH 1988 78,3:306-307). This is not surprising given our present lack of understanding about the causes of cancer. The excess number of cancers is not confined to a single anatomical site (Table 9). This suggests that exposure to a single environmental factor is unlikely to be the cause of the apparent increase in the Noe/Eureka Valley area.

Follow-up analyses

Discussions were held with Lynn Goldman, M.D., M.P.H. and Donald Austin, M.D., M.P.H., Environmental Epidemiology and Toxicology Section, California Department of Health Services to decide how to proceed. Our first action was to analyse the most recently available cancer registry data for the SF-O SMSA (1986 and 1987-to date). About 75% of 1987 San Francisco cancers had been included in the registry by this time. None of the 24 cases of childhood cancers diagnosed in San Francisco in 1986 or 1987 (cases reported by October 1988) were from the Noe/Eureka Valley area. These data do not indicate a continuing problem of increased childhood cancer in the Noe/Eureka Valley area. However the San Francisco Department of Public Health (in association with concerned citizens) will undertake an investigation of environmental exposures of concern. A follow-up epidemiological study will also be done to identify geographical sites of possible environmental exposures. The Department will continue to monitor new cases of childhood cancer occurring in the Noe/Eureka Valley area.

Table 1. Age-specific incidence rates* for childhood cancer-San Francisco-Oakland SMA

Age group	All cancers #/Rate	Leukemia #/Rate	Brain/Other CNS #/Rate
0-4	584 (18.6)	190 (6.1)	93 (3.0)
5-9	372 (11.4)	129 (4.0)	99 (3.0)
10-14	442 (12.0)	86 (2.4)	75 (2.0)

* /100,000

(From: The Incidence of Childhood Cancer San Francisco Oakland Metropolitan Statistical Area 1970-1984. Technical Report No. 3 Cancer Prevention Section, California Department of Health Services.

Table 2. Child years at risk, San Francisco 1973-1985.

Age group	Child years 1973-1985
0-4	482,680
5-9	431,529
10-14	462,544

(From: Population Projections for California Counties, Population Research Unit, California Department of Finance)

Table 3. Observed and expected childhood cancer cases, San Francisco 1973-1985.

Age group	All Cancers # Obs(CI)	# Exp.	Leukemia # Obs(CI)	# Exp.	Brain/NS # Obs(CI)	# Exp.
0-4	92(74.2-112.8)*	89.5	39(27.3-55.3)	29.4	12(6.2-21.0)	14.4
	(69.2-119.7)**		(24.8-58.9)		(4.9-24.2)	
5-9	54(40.6- 70.5)	49.1	17(9.9-27.2)	17.2	12(6.2-21.0)	12.9
	(36.9- 76.0)		(8.2-30.8)		(4.9-24.2)	
10-14	45(32.8- 60.2)	55.4	11(5.5-19.7)	11.1	9(4.1-17.1)	9.2
	(29.6- 65.3)		(4.3-22.8)		(3.1-20.0)	
0-14	191(164.9-220.1)	194.0	67(51.9-85.1)	57.7	33(22.7-46.4)	36.5
	(157.3-229.8)		(47.8-91.1)		(20.1-50.9)	

*95% CI based on Poisson distribution.
**99% CI based on Poisson distribution.

Table 4. Observed and expected childhood cancer cases, Haight area, 1973-1985.

Age group	All Cancers # Obs(CI)	# Exp.	Leukemia # Obs(CI)	# Exp.	Brain/NS # Obs(CI)	# Exp.
0-4	3(0.6- 8.8) (0.3-11.0)	3.9	1(0.01-5.6) (0.0- 7.5)	1.3	0(0-3.7) (0-5.3)	0.6
5-9	3(0.6- 8.8) (0.3-11.0)	2.0	1(0.01-5.6) (0.0- 7.5)	0.7	0(0-3.7) (0-5.3)	0.5
10-14	1(0.01-5.6) (0.0- 7.5)	2.2	0(0- 3.7) (0- 5.3)	0.4	0(0-3.7) (0-5.3)	0.4
0-14	7(2.8-14.2) (2.0-17.2)	8.1	2(0.2- 7.2) (0.1- 9.3)	2.4	0(0-3.7) (0-5.3)	1.5

Table 5. Observed and expected childhood cancer cases, Noe/Eureka Valley Area, 1973-1985.

Age group	All Cancers # Obs(CI)	# Exp.	Leukemia # Obs(CI)	# Exp.	Brain/NS # Obs(CI)	# Exp.
0-4	14(7.7-23.5) (6.2-26.8)	5.7	5(1.6-11.7) (1.0-14.2)	1.9	3(0.6- 8.8) (0.3-11.0)	0.9
5-9	3(0.6- 8.8) (0.3-11.0)	3.0	0(0- 3.7) (0- 5.3)	1.1	2(0.2- 7.2) (0.1- 9.3)	0.8
10-14	4(1.1-10.2) (0.6-12.6)	3.1	2(0.2- 7.2) (0.1- 9.3)	0.6	0(0- 3.7) (0- 5.3)	0.5
0-14	21(13.0-32.1) (11.1-36.0)	11.8	7(2.8-14.4) (2.0-17.2)	3.6	5(1.6-11.7) (1.1-14.2)	2.2

Table 6. Observed and expected childhood cancer cases, East Sunset area, 1973-1985.

Age group	All Cancers # Obs(CI)	# Exp.	Leukemia # Obs(CI)	# Exp.	Brain/NS # Obs(CI)	# Exp.
0-4	6(2.2-13.1) (1.5-15.7)	4.9	5(1.6-11.7) (1.1-14.2)	1.6	1(0.01-5.6) (0.0- 7.5)	0.8
5-9	6(2.2-13.1) (1.5-15.7)	2.7	0(0- 3.7) (0- 5.3)	0.9	0(0- 3.7) (0.0- 7.5)	0.7
10-14	4(1.1-10.2) (0.6-12.6)	3.3	1(0.01-5.6) (0.0- 7.5)	0.7	1(0.01-5.6) (0.0- 7.5)	0.5
0-14	16(9.1-26.0) (7.6-29.5)	10.9	6(2.2-13.1) (1.5-15.7)	3.2	2(0.2- 7.2) (0.1- 9.3)	2.0

Table 7. Observed and expected childhood cancer cases, rest of San Francisco, 1973–1985.

Age group	All Cancers # Obs(CI)	All Cancers # Exp.	Leukemia # Obs(CI)	Leukemia # Exp.	Brain/NS # Obs(CI)	Brain/NS # Exp.
0–4	69(53.7– 87.3)	75.0	28(18.6–40.5)	24.6	8(3.4–15.8)	12.1
	(49.5– 93.4)		(16.2–44.7)		(2.5–18.6)	
5–9	42(30.3– 56.8)	41.4	16(9.1–26.0)	14.5	10(4.8–18.4)	10.9
	(27.2– 61.8)		(7.5–29.5)		(3.7–21.4)	
10–14	36(25.2– 49.8)	46.8	8(3.4–15.8)	9.4	8(3.4–15.7)	7.8
	(22.4– 54.6)		(2.5–18.6)		(2.5–18.6)	
0–14	147(124.2–172.8)	163.2	52(38.8–68.2)	48.5	26(17.0–38.1)	30.8
	(117.6–181.2)		(35.3–73.6)		(14.7–42.3)	

Table 8. Childhood cancer cases, San Francisco and Noe/Eureka Valley by year, 1973–1985.

Year	Noe Valley	San Francisco
1973	2	17
1974	1	15
1975	0	9
1976	0	17
1977	2	16
1978	1	17
1979	1	11
1980	4	16
1981	1	10
1982	1	19
1983	3	16
1984	4	15
1985	1	13
Total	21	191

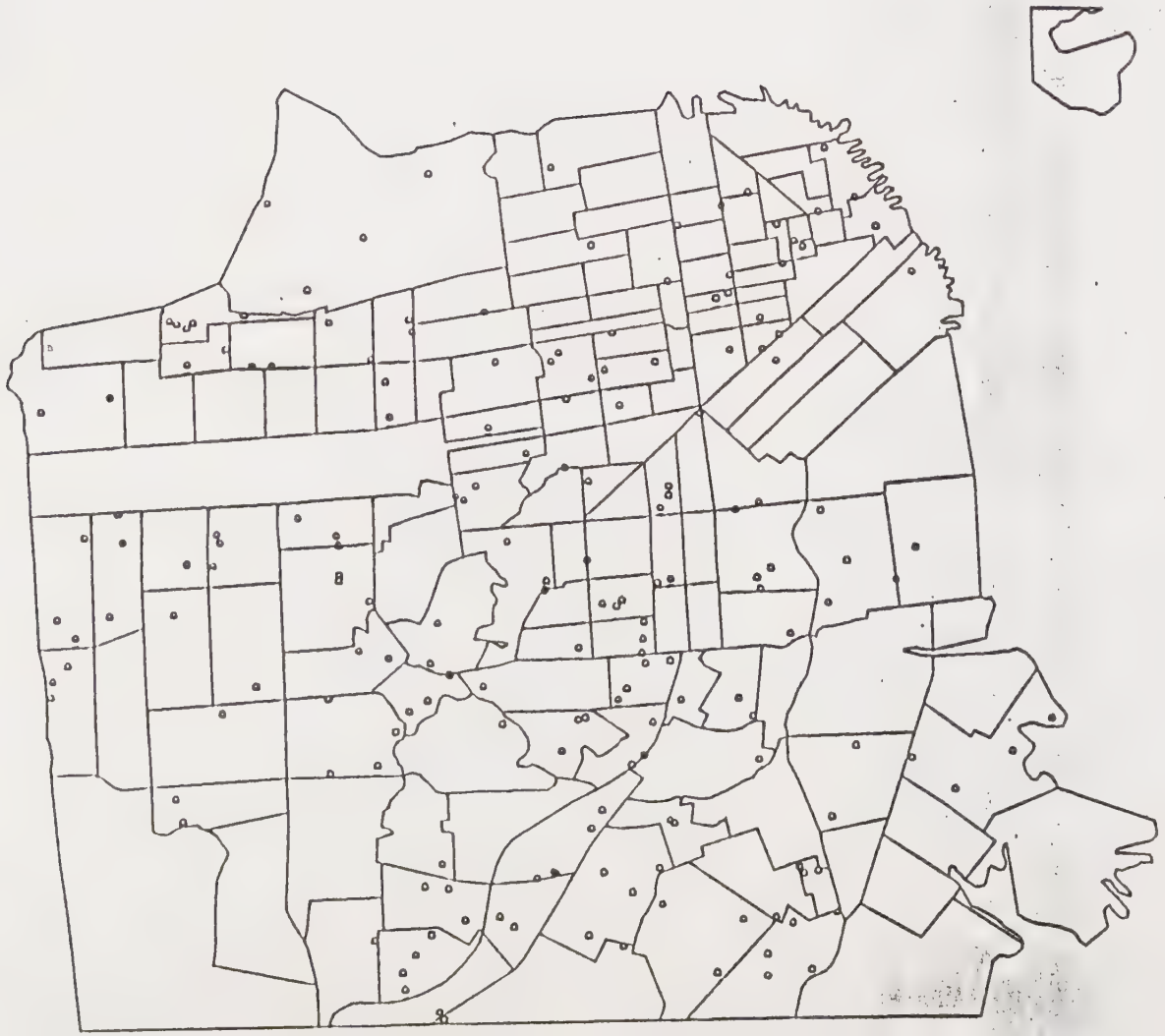
Table 9. Childhood cancer cases, Noe/Eureka Valley, 1973–1985

Cancer type	# Obs	# Esp.	Increase in Cases
Acute lymphocytic leukemia	5		
	>	3.6	3.4
Other leukemia	2		
Brain and nervous system	5	2.2	2.8
Retinoblastoma	3		
Bone	2		
Soft Tissue	2 >	6.0	3.0
Wilms	1		
Pineal gland	1		
Total	21	11.8	9.2

Figure 1.

SAN FRANCISCO CANCER CASES 1973–1985

⟨15 YEARS ALL SITES



Legend

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Section 2. Cancer incidence rates in white San Francisco residents, 1981-1985.

This report addresses whether:

1) For the period 1981-1985 the observed number of cancers in white residents of San Francisco was higher than expected (based on incidence rates for the San Francisco-Oakland Metropolitan Statistical Area)?
2) For the period 1981-1985 were the observed number of cancers in white residents of the designated areas higher than expected (based on incidence rates for the San Francisco Oakland Metropolitan Statistical Area)?

The period 1981-1985 was chosen as rates for the San Francisco-Oakland Metropolitan Statistical Area (SF-O SMA) were available for this period in computerized form. Analyses were restricted to white San Francisco residents to avoid the confounding effect on cancer incidence of ethnicity.

Methods

The observed numbers of cases occurring in white residents of San Francisco during the period 1981-1985 were calculated by sex for each area using data from the SEER public use tape for the SF-O MSA, 1973-1985. Cases with ICD-O 1976 morphology codes 980-994 were defined as leukemia cases. The number of person years at risk for each age/sex group was calculated for San Francisco whites for 1981-1985 using 1980 US Census data (obtained from the Population Research Unit, California Department of Finance) adjusted by the projected population increases in 1981-1985. The expected numbers of cancer cases were calculated applying 1981-1985 SEER rates for whites. Using public domain software (CANCER CALC) developed by Michael Layefsky, California Department of Health Services. Confidence limits (95% and 99%) for a Poisson distribution were estimated for the observed numbers using CANCER CALC.

Results

Because of an excess in cases of Kaposi's sarcoma in San Francisco as a whole and in the Haight, Noe/Eureka Valley and Rest of San Francisco areas there were statistically significantly greater than expected numbers of male all cancers. Kaposi's sarcoma is a previously rare tumor (0.02% of all cancers reported in the USA) which has increased in incidence with the AIDS epidemic. Between 1981-1985 Kaposi's sarcoma accounted for 9.2% of all cancers in San Francisco white males and 2.6% of all cancers in SF-O MSA white males. The remaining non-statistical increases of 33 cases in Noe/Eureka Valley and 23 cases for the rest of San Francisco may be due to increase of other AIDS related tumors, e.g., non-Hodgkins lymphoma. For none of the areas were there statistically significant differences in leukemia cases (Table 1 & 2).

There were no statistically significant differences in female all cancers or leukemia (Table 3).

Discussion

There is a greater than expected number of cases of cancer in white San Francisco males (and in three of the San Francisco areas studied). This increase is accounted for by an increase in Kaposi's sarcoma. There is no increase in the number of cases of cancer in white San Francisco females (or in any of the San Francisco areas studied).

Recommendations

Based on the cancer incidence for whites between 1981 and 1985 there is no indication that residents of the Haight, Noe/Eureka Valley or East Sunset areas are at higher risk for cancers other than those associated with AIDS. No immediate further investigations are suggested by these data.

Table 1. Observed and expected all cancer and leukemia cases, white males, San Francisco areas, 1981–1985.

Area	All Cancers # Obs(CI)	All Cancers # Exp.	Leukemia # Obs(CI)	Leukemia # Exp.
San Francisco	6581(6423-6742) (6374-6793)	6171	158(134-185) (127-193)	165
Haight	335(300- 372) (290- 385)	282	9(4- 17) (3- 20)	8
Noe/Eureka Valley	610(563- 660) (548- 677)	432	14(8- 23) (6- 27)	12
East Sunset	426(387- 468) (375- 482)	492	12(6- 21) (5- 24)	13
Rest of S.F.	5210(5069-5353) (5026-5399)	4965	123(102-147) (96-155)	132

Table 2. Greater than expected numbers of male cancers and cases of Kaposi's sarcoma, white males San Francisco areas 1981–1986

Area	# All cancers	# Kaposi's sarcoma*
San Francisco	410	447
Haight	53	85
Noe/Eureka Valley	178	145
East Sunset	-66	-5
Rest of San Francisco	245	222

*(Observed Kaposi's sarcoma cases - 2.6% of all expected cancers)

Table 3. Observed and expected all cancer and leukemia cases, white females, San Francisco areas, 1981-1985.

Area	All Cancers # Obs(CI)	All Cancers # Exp.	Leukemia # Obs(CI)	Leukemia # Exp.
San Francisco	6551(6393-6712) (6344-6762)	6786	125(105- 149) (98- 157)	142
Haight	245(215- 277) (207- 288)	265	2(0.22- 7) (0.08- 9)	6
Noe/Eureka Valley	463(422- 507) (409- 521)	454	9(4- 17) (3- 20)	10
East Sunset	565(519- 614) (506- 629)	624	9(4- 17) (3- 20)	13
Rest of S.F.	5278(5137-5422) (5093-5468)	5443	105(86- 127) (80- 134)	113